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HAECKEL'S GASTRÆA THEORY.

BY ALEXANDER AGASSIZ.

PROFESSOR HAECKEL has just published in the *Jenaische Zeitschrift*[1] a second paper on the gastræa theory, devoted to answering the many attacks to which it has been subjected. It is fortunately free from the personalities which disfigure so many of Haeckel's productions, and consists mainly of new theories and new interpretations of well-known embryological facts. Haeckel now endeavors by a most ingenious theory to explain the phenomena of segmentation, which (according to him) conceal the original unity of the gastræa in the different classes of the animal kingdom. As Haeckel now presents the gastræa theory it would be difficult to recognize it as he and his followers formerly understood it.

It is unfortunate that Haeckel should feel obliged to coin so many new terms, for unless the reader can throw himself, heart and soul, into Haeckel's position, he will hardly feel inclined to master the delicate shades of meaning which a difference in prefix or termination involves. They undoubtedly contribute to the terseness of the text, but are so numerous that the reader can scarcely be expected to carry in his mind the necessary vocabulary, much of it dating back to the Generelle Morphologie.

Haeckel has made an important admission in going back for his starting-point to the egg (as the opponents of his theory urged), and attempting to trace how far segmentation can be influenced by natural selection; he has of course seen the difficulty, of which all embryologists are aware, of accounting through such a cause for the vital divergence observed in the segmentation of closely allied groups, leading eventually to the same result. It is difficult even in the wildest flight of imagination to frame a theory to account not only for these radical differences of development in the ancestral eggs, living in the same medium, subject to identical influences, but also for their transmission by inheritance. Haeckel's explanation of the causes which have led to the concealment of the descent of the gastrula is that only those embryonic processes which can be traced directly to a former independent ancestral form, and can be inherited, are of primary importance for the recognition of genetic connection, while those embryonic phenomena which are due to adaptation of the embryo or larval condition can claim only a very secondary importance. It is by palingenesis and cenogenesis, the terms he applies to primary and secondary embryonic phenomena, that he accounts for the divergence observed in the earlier embryonic stages. Whether we agree with Haeckel or not, his paper cannot fail to be most suggestive, as this is the first attempt to tabulate the early embryonic stages of the egg in the different classes of the animal kingdom, with a view to account for their difference on the theory of natural selection; the more interesting, coming as it does from the investigator who first tested the theory of descent by the monographic study of a great group. It is not our purpose to describe the many subordinate phenomena, either of palingenesis or of cenogenesis, quoted by Haeckel; we merely wish to call attention to the dangerous path he treads when he explains anomalies as falsifications of the record in either time or space. When we have to resort to such devices, no explanation at all is fully as satisfactory.

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[1] Die Gastrula und die Eifurchung der Thiere.

Armed with this new instrument of investigation, Haeckel carefully compares the different modes of segmentation resulting in the gastrula, to which he had already alluded in his Anthropogenie. He then takes up the same subject for the several classes of the animal kingdom, and treats it with his usual ingenuity, and closes with the phylogenetic interpretation to be assigned to the early stages of embryonic development. Of these he recognizes five as of primary importance: the "monerula," or the first stage of metazoan development; the second stage, representing the egg as commonly understood, which he calls the "cytula;" the third, the "morula," or mulberry stage; the fourth, the "planæa" (formerly known as "planula," though very different stages were often spoken of under that name); and the fifth, the "gastrula."

This paper is accompanied by two plates of diagrammatic sketches copied from various authors, representing the segmentation and gastrula of various invertebrates and vertebrates. Haeckel gives in addition original figures of the same stages in a crustacean, an annelid, a mollusk, and a bony fish. It is a great pity that such a skillful draughtsman should give such untrustworthy figures to illustrate so fundamental a theory, and quietly fall back upon the righteousness of his cause. His figure of a fish embryo has no value as a copy of nature; it is a diagram simply. Such an embryo may exist, but the distrust naturally felt of such fictitious illustrations, by all who are familiar with a portion of his subject, naturally extends in the first place to all his figures and lastly to his whole theory.

The plate devoted to the segmentation of the bony fish is particularly important, as it gives us a totally different interpretation of the formation of the embryo from the one usually accepted. Haeckel's observations were made on the pelagic eggs of what he calls a Gadoid. Judging from closely allied eggs we have had the opportunity to study on our coast, we should say they were more probably Cottoid eggs.

It may not be out of place to call attention to the great abundance of pelagic fish eggs readily obtained, in all stages of development, during the breeding season of a number of our common marine fishes. With the exception of the very earliest stages of segmentation, only to be obtained, owing to the rapidity of the process, by means of artificial fecundation, I know of no method so readily accessible for studying the embryology of fishes as that of collecting pelagic fish eggs. I have myself studied more or less completely the embryology of our sea-perch, tautog, two species of sculpins, two species of flounders, a Motella (young Phycis ?), our blue-fish, menhaden, butter-fish, goose-fish, and several other species of uncertain origin. These pelagic eggs are by no means as delicate as eggs usually laid on the ground and obtained by ordinary artificial fecundation, and the young embryos can generally after hatching be retained alive for a considerable period.

THE SUMMER BIRDS OF THE WHITE MOUNTAIN REGION.

BY H. D. MINOT.

As in this article I mean to speak of the birds found in summer in the region of the White Mountains, I may state that my information in regard to them has been drawn from observations made at Conway and Bethlehem. At North Conway, where I spent several weeks in the year 1872, I observed, through whatever part of the neighboring country I went, an almost entire absence of birds. That township, owing to its situation in a valley to the south of the White Mountains, and other causes perhaps, contained, to my knowledge, few birds beside the ruffed grouse, a few ducks in the rivers, sandpipers, one pair of hawks, one pair of kingfishers, a few robins, and the proverbial village swallows. But Bethlehem, the highest village of New England, sixteen hundred feet above the level of the sea, blessed with a cool, invigorating climate, situated to the westward of Mount Washington,